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(54) Newborn's Growth Adjustable Absorbent Diaper Having  
Variable Overlapping and Non-Overlapping Ears

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ABSTRACT OF THE DISCLOSURE

A growth adjustable diaper for newborn babies is adjustable in length by use of a foldable absorbent panel at the front edge of the diaper  
5 and comprises an elastic member positioned between the foldable panel and a topsheet.

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PATENT

NEWBORN'S GROWTH ADJUSTABLE ABSORBENT DIAPER HAVING  
VARIABLE OVERLAPPING AND NON-OVERLAPPING EARS

Background of the Invention

- 5 This invention pertains to a disposable article and, more particularly, to a disposable absorbent article that is adjustable in length and attachment to accommodate the relatively fast growth of a newborn baby.
- 10 Currently, disposable absorbent articles find widespread use in infant and child care and have generally replaced reusable cloth absorbent articles. A typical disposable absorbent article generally comprises a composite structure including a topsheet, a backsheet, and an absorbent between the topsheet and backsheet. These articles
- 15 usually include some type of fastening system for fitting the article onto the wearer.

Although current disposable baby diapers have been generally accepted by the public, these diapers still have need of improvement in specific areas. For example, mothers of newborns between the age of zero and generally about four months are aware of the irritation that current disposable diapers cause with the umbilical cord during the first month of the newborn's existence. Naturally, any irritation of the umbilical cord is a discomfort to the newborn and of anxious concern to the mother. Another serious concern to mothers is the tenderness of the newborn's skin and, thus, its sensitivity to even slight pressures or rubbing actions that can cause irritation and red marking. With current diapers, this irritation or pressure is caused by leg elastics that press the diaper tightly against the newborn's skin to prevent urine leakage. It also can occur at the waist area where the back ears of the diaper are adhesively attached tightly to

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the front section of the diaper. Thus, it can be appreciated that current diapers do not provide an optimum absorbent article for newborn babies.

- 5 In addition to concerns for the newborn's healing umbilical cord area and tender, sensitive skin is the relatively rapid growth of the newborn between the time when he or she is born to approximately the age of four months. During this time, the newborn will grow in length and weight from about six pounds to about fifteen pounds, thus
- 10 posing a problem to the mother, since the diaper the mother was first using was sized for the baby at birth, while the next size diaper may not be appropriate to a newborn during this rapid growth stage. Thus, it would be desirable to have a diaper exclusively designed for a newborn, between the age of zero and about four months, that
- 15 provides adjustability in size to accommodate this rapid growth.

Summary of the Invention

In one form of the invention, there is provided a growth-adjustable absorbent article having a length comprising a backsheet including a front section, a back section, and an intermediate crotch section, and a main absorbent body disposed on at least the intermediate crotch section. A foldable panel is disposed on the front section between the main absorbent body and the front edge of the front section. This foldable panel is moveable between a first position, 20 in which it is substantially coplanar with the main absorbent body, and a second position, in which the foldable panel is folded inwardly upon the main absorbent body, thereby providing adjustability to the article. An elastic member is positioned between the foldable panel 25 and the topsheet such that the front section curves concavely, in the direction of the topsheet, when the foldable panel is substantially coplanar with the main absorbent body and when the elastic member is relaxed.

Brief Description of the Drawings

30 The above-mentioned and other features of the present invention, and the manner of attaining them, will become more apparent, and the invention itself will be better understood, by reference to the

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following description of the invention taken in conjunction with the accompanying drawings, wherein:

5 **Fig. 1 is a top plan view of the bodyside of a preferred embodiment of the present invention when laid flat;**

**Fig. 2 is a top plan view of the backside of the embodiment in Fig. 1 when laid flat;**

10 **Fig. 3 is a cross-section of the embodiment in Fig. 1 taken along line 3-3 and viewed in the direction of the arrows;**

**Fig. 4 is an exploded perspective of the embodiment in Fig. 1;**

15 **Fig. 5 is a top plan view of the bodyside of a modification to the embodiment in Fig. 1;**

**Fig. 6 is a view of the embodiment in Fig. 1 on a newborn baby with the foldable absorbent panel folded inwardly and the ears 20 overlapping;**

**Fig. 7 is similar to Fig. 6 except that the ears do not overlap;**

25 **Fig. 8 is similar to Fig. 7 except that the foldable absorbent panel has been unfolded with the ears attached thereto;**

**Fig. 9 is a perspective view of the embodiment in Fig. 1; and**

**Fig. 10 is a perspective view of another cushion barrier.**

30 **Fig. 11 is a cross-section view of the embodiment in Fig. 1 taken along line 11-11 and viewed in the direction of the arrows.**

**Description of a Preferred Embodiment**

35 **The absorbent articles of the present invention will be described herein in relationship to their use in non-reusable, disposable absorbent articles, but it should be understood that potential uses**

of the absorbent structures of the present invention need not be limited to non-reusable, disposable absorbent articles. As used herein, the term "non-reusable, disposable absorbent article" refers to articles which absorb and contain body exudates and are intended 5 to be discarded after a limited period of use. The articles are not intended to be laundered or otherwise restored for reuse. The articles can be placed against or in proximity to the body of the wearer to absorb and contain various exudates discharged from the body. While the present description will particularly be made in the 10 context of a diaper article, it should be understood that the present invention is also applicable to other disposable personal care absorbent articles, such as adult incontinence garments, sanitary napkins, and children's training pants as well as surgical bandages and sponges.

15 Referring to Figs. 1-4, 9 and 11, a preferred embodiment of the present invention is illustrated as diaper 2 comprising front section 4 having front edge 6, back section 8 having back edge 10, and intermediate crotch section 12. Back section 8 preferably further 20 comprises a pair of ear members 14 and 16 attached to or integral with back section 8. Generally, ear members 14 and 16 will be integral to back section 8.

25 Diaper 2 further comprises backsheet 18 and topsheet 20 having positioned therebetween main absorbent body 22. Backsheet 18 and topsheet 20 may be of the same size and shape in which ear members 14 and 16 would be formed by extensions of and, thus, be integral with backsheet 18 and topsheet 20. If desired, topsheet 20 need not be coincident with backsheet 18, but it is preferred that both 30 backsheet 18 and topsheet 20 have a length and width greater than that of main absorbent body 22 to allow their peripheries to be attached in any suitable manner. As illustrated in Fig. 3, main absorbent body 22 does not extend the full length of diaper 2 but is positioned at least at intermediate crotch section 12. As such, 35 absorbent body 22 does not have an absorbent portion which extends beyond front edge 6 or back edge 10.

Preferably, backsheet 18 has both cloth-like and liquid-impermeable properties. The cloth-like properties are naturally preferred on the outermost surface of backsheet 18 to give a natural, cloth feel to diaper 2 for both the newborn and mother or caretaker. This is in contrast to current diapers that use only a polymeric film material as the backsheet and has a plastic touch or feel. One means of providing backsheet 18 with both cloth-like and liquid-impermeable properties is to construct it of two plies, a liquid-impermeable inner ply 24, which may also be breathable or nonbreathable to vapor, and a cloth-like outer ply 26. Inner ply 24 can be a thin film of liquid-impermeable material that is extruded onto a spunbond material as outer ply 26.

Topsheet 20 is permeable to liquids, such as urine and, in one of the unique aspects of the present invention, has a very soft feel or texture that is highly desirable for the sensitive, tender skin of a newborn. One preferred means of providing topsheet 20 with this extremely soft feel or texture is to construct it of a matrix of fibers in which all, or at least some, of the fibers are bicomponent fibers. These bicomponent fibers can be side-by-side or sheath-core construction. A more detailed description of topsheet 20 is provided hereafter. In one preferred embodiment, topsheet 20 is a two-layer composite comprising liner layer 21 made of bicomponent fibers and surge layer 23 made of a mixture of bicomponent fibers and other fibers. Liner layer 21 and surge layer 23 can be placed on top of each other without any additional step of bonding the two layers together, or liner layer 21 and surge layer 23 may be placed together followed by a bonding or joining step that integrates layers 21 and 23 together to form topsheet 20. Surge layer 23 preferably is narrower than liner layer 21 and centered between cushion barriers 52 or containment flaps 64 (Fig. 5). Surge layer 23 preferably is between liner layer 21 and absorbent body 22.

Ear members 14 and 16 have respective, releasably-engageable surfaces 32 attached near their ends on inner surface 34 of diaper 2. Each releasably-engageable surface or means herein may comprise, for example, a hook surface comprising a plurality of hook members (not

shown) that are compatible with a loop surface comprising a plurality of loop members, a cohesive system, or a mechanical fastener system. A cohesive system generally only sticks to itself, while being nonsticky to other surfaces. A mechanical fastening system may 5 comprise a buckle or snap fasteners.

Diaper 2 further includes outer surface 36 on which is placed three releasably-engageable surfaces 38, 40, and 42. Releasably-engageable surface 38 is attached to either or both ear member 14 or ear 10 member 16 and, in Fig. 3 is illustrated as being attached to ear member 16 on outer surface 36. Releasably-engageable surfaces 40 and 42 are attached to outer surface 36 at front section 4. As illustrated in Figs. 2 and 3, releasably-engageable surface 40 is near front edge 6 and releasably-engageable surface 42 is spaced or 15 positioned slightly inwardly of releasably-engageable surface 40. If desired, releasably-engageable surfaces 40 and 42 can be one single releasably-engageable surface. Releasably-engageable surfaces 38, 40, and 42 respectively may, for example, comprise a plurality of loop members (not shown) that are compatible with a plurality of hook 20 members on releasably-engageable surfaces 32.

A pair of elasticized leg cuffs 44 may be positioned on respective longitudinal sides of diaper 2 and, preferably, are attached between backsheet 18 and topsheet 20. Leg cuffs 44 can be liquid permeable 25 or liquid impermeable, and are preferably elasticized by a plurality of elastic threads 46. Leg cuffs 44 are preferably a two-ply composite in which the outermost ply is liquid impermeable and the innermost ply is liquid permeable. In this design, the outermost ply can be made of the same material as backsheet 18, and the innermost 30 ply can be made of the same material as liner layer 21. If it is desired that leg cuffs 44 be liquid permeable, both plies can be made of the same or different permeable materials.

In addition to main absorbent body 22, diaper 2 further comprises 35 foldable absorbent panel 48 between main absorbent body 22 and front edge 6. As with main absorbent body 22, foldable absorbent panel 48 is positioned between backsheet 18 and topsheet 20. Foldable

absorbent panel 48 can be made of the same absorbent material as main absorbent body 22 and, as illustrated in Fig. 3, may be spaced from main absorbent body 22. If desired, main absorbent body 22 and foldable absorbent panel 48 can be integral and yet separately 5 identified by embossing, creasing, aperturing, or the like, so as to permit foldable absorbent panel 48 to fold inwardly as indicated in Figs. 6 and 7. It should also be noted that releasably-engageable surface 40 is foldable inwardly with absorbent panel 48 as are those portions of backsheet 18 and topsheet 20 that overlie absorbent 10 panel 48. If desired, foldable panel 48 can be made of a nonabsorbent material preferably having liquid-damming or barrier characteristics.

In order to provide elasticity to the front waist portion of 15 diaper 2, which is that portion of front section 4 adjacent front edge 6, a plurality of elastic threads 50 are positioned between absorbent panel 48 and topsheet 20. Elastic threads 50 can be first stretched and then adhered to either topsheet 20 or panel 48, or both. Alternatively, elastic threads 50 can be made of a 20 heat-elasticizable material in which they are joined in a relaxed condition and then heated to become elastic so as to gather topsheet 20. If desired, elastic threads 50 can be joined to a separate layer of material to form an elastic composite and then positioned between topsheet 20 and absorbent panel 48.

25 Referring to Fig. 11, by positioning the elastic threads 50 between absorbent panel 48 and topsheet 20, front section 4 has been found to curve concavely in the direction of the topsheet or, alternatively, in the direction of the abdomen of a wearer when the foldable panel 30 is substantially coplanar with the main absorbent body and when the elastic threads are relaxed. By having the front section 4 curve concavely in the direction of the topsheet when the foldable panel is substantially coplanar with the main absorbent body and when the elastic threads are relaxed, the absorbent article has been found to 35 fit a wearer, such as a baby, better by providing a more snug fit against the wearer's abdomen and to exhibit improved moisture leakage control.

When absorbent foldable panel 48 is folded inwardly upon the main absorbent body, front section 4 has been found to curve concavely in the direction of the abdomen of a wearer, while curving convexly in the direction of the topsheet, when the elastic threads are relaxed.

5 When absorbent foldable panel 48 is folded inwardly upon the main absorbent body, the positioning of the elastic threads 50, between absorbent panel 48 and topsheet 20, generally results in the absorbent foldable panel remaining in its folded position more readily than that which results from other placements of the elastic threads.

10 Also, with such a positioning of the elastic threads, the absorbent article generally need not be as tightly fastened to the wearer in order to ensure that the absorbent foldable panel stays in place. When absorbent foldable panel 48 is folded inwardly upon the main absorbent body and placed on a wearer, absorbent foldable

15 panel 48 may not snuggly contact the main absorbent body 22, thus, forming a pocket-like void space between the absorbent foldable panel and the main absorbent body. Such a void space generally enhances the absorptive capabilities of the absorbent article by retaining wastes and preventing such wastes from leaking out of the front

20 section of the absorbent article.

One unique aspect of the present invention, that addresses the sensitivity and tenderness of a newborn's skin, is the presence of cushion barriers that assist in preventing leakage while minimizing any irritation or red marking of the skin. A pair of curved crotch cushion barriers 52 are provided on opposite sides of main absorbent body 22 at least in the area of intermediate crotch section 12. Each crotch cushion barrier is spaced slightly apart from main absorbent body 22 so that they may easily flex or fold to match the newborn's body shape. Each cushion barrier 52 has a top surface 54 that extends upwardly beyond main absorbent body 22 in order to provide a cup-like shape and, more importantly, to seal gently against the newborn's skin. Each cushion barrier 52 is generally elongate in shape and may be cylindrical, rectangular, oval, or the like, in its transverse, cross-sectional shape. Cushion barriers 52 can be made of the same material as main absorbent body 22 or can be made of other material that is not absorbent, but resilient, to provide a

damming effect to body wastes and a gentle seal against the skin. If desired, an elastic member 56 can be provided to each cushion barrier 52 between the respective cushion barrier 52 and backsheet 18. Elastic members 56 serve to urge cushion barriers 52 against the newborn's skin in a gentle, soft manner. Elastic members 56 can be of the same construction and of the same materials as described for elasticizing foldable absorbent panel 48 with elastic threads 50. Elastic members 56 are preferably elongate members similar in length and width to their respective cushion barriers 52. The height with which top surfaces 54 extend upwardly, beyond the top surface of main absorbent body 22, will vary depending upon the absorbent materials used, the size and shape of diaper 2, and the like. Cushion barriers 52 are preferably positioned between backsheet 18 and liner layer 21 but may be on top of liner layer 21.

25 Back section 8 includes back waist cushion barrier 58 positioned between main absorbent body 22 and back edge 10. Preferably, back waist cushion barrier 58 is sandwiched between backsheet 18 and liner layer 21 but may be on the top of liner layer 21. Back waist cushion barrier 58 can be made of the same materials as crotch cushion barriers 52 and includes a back waistband 60. Back waistband 60 can be constructed like and made of the same materials as front waistband 51. Thus, back waistband 60 can comprise elastic threads 30 62 that are identical or similar to elastic threads 50 of front waistband 51. Back waist cushion barrier 58 serves both to provide a gentle cushion against the newborn's skin and to provide a waste barrier at the back of diaper 2. Back waist cushion barrier 58 is generally of the same width as main absorbent body 22 at back section 8 but, naturally, can be greater or lesser in width than 35 absorbent body 22, as desired.

Referring to Fig. 5, diaper 2 has been modified to replace crotch cushion barriers 52 with a pair of containment flaps 64 and to replace back waist cushion barrier with waste containment flap 66. Containment flaps 64 can be made of the same material as liner layer 21, or may be made of other suitable material. Containment flaps 64 can be formed in generally one of two methods. One method is to make each containment flap 64 as an individual structural element and then attach it in any suitable manner to liner layer 21. In this method, each proximal edge 68 of a respective containment flap 64 is attached to liner layer 21. In another method, containment flaps 64 are made from liner layer 21 by essentially pleating liner layer 21 and then adhering proximal edges 68 together. In both methods, distal edges 70 include at least a single strand 72 of stretchable material that is attached in a stretched condition to distal edges 70. Front ends 74 and back ends 76 of containment flaps 64 are secured to liner layer 21. Upon relaxing or fitting diaper 2, elastic strands 72 cause edges 70 to extend upwardly from liner layer 21. As described, containment flaps 64 are located inwardly or inboard of leg cuffs 44, as are cushion barriers 52. A more detailed description of the construction of flaps 64 is contained in U.S. Patent No. 4,704,116 to Enloe, the contents of which are incorporated by reference herein.

Waste containment flap 66 can be identical or similar to containment flaps 64, except that it is attached at back section 8 near back edge 10. Waste containment flap 66 can be constructed in the same manner as containment flaps 64 and can be made of the same materials. Both containment flaps 64 and waste containment flap 66 can be made of liquid-impermeable or liquid-permeable materials as described hereafter.

Referring to Fig. 6, diaper 2 is illustrated as it would appear at its shortest length of about 12 inches to about 13.75 inches on a newborn. Diaper 2 is fitted on a newborn in generally the same manner as current diapers, except for the following steps. Foldable absorbent panel 48 is folded inwardly so that the inner surfaces of foldable absorbent panel 48 and main absorbent body 22 are in

mutually-facing relationship. Folded with foldable absorbent panel 48 are releasably-engageable surface 40 and front waistband 51. Releasably-engageable surface 40 is made of a soft material that will not irritate the baby's skin. After this folding step, the newborn 5 can be placed on diaper 2, and front section 4 is pulled between the legs and towards and against the front of the baby. Ear members 14 and 16 are then wrapped around the waist of the newborn and positioned such that hook surface 32 of ear member 16 releasably engages nonfoldable, releasably-engageable surface 42, and 10 releasably-engageable surface 32 of ear member 14 engages releasably-engageable surface 38 on ear member 16. This fastening of ear members 16 and 14 to nonfoldable, releasably-engageable surface 42 and releasably-engageable surface 38, respectively, can be adjusted in order to snugly, but comfortably, fit diaper 2 to the 15 newborn. In this folded form, diaper 2 is in its shortest length, and ear members 14 and 16 overlap each other to accommodate the newborn's waistline which is at its smallest measurement at this point of the newborn's life. As used herein, the term "nonfoldable", used in reference to releasably-engageable surface 42, is meant to 20 indicate that releasably-engageable surface 42 does not fold inwardly upon the main absorbent body with absorbent panel 48.

Referring to Fig. 7, as the newborn begins to rapidly grow during the first several weeks or months after birth, diaper 2 can be adjusted 25 as necessary to match this growth trend. Foldable absorbent panel 48 can remain folded inwardly, but ear members 14 and 16 can be positioned on nonfoldable, releasably-engageable surface 42 in a non-overlapping manner as necessitated by the newborn's increasing waistline. In this intermediate size adjustment of diaper 2, 30 releasably-engageable surfaces 32 of both ear members 14 and 16 are attached to nonfoldable, releasably-engageable surface 42.

As the newborn continues to rapidly grow, diaper 2 continues to match this development in both the length and the width of the newborn. As 35 illustrated in Fig. 8, to accommodate the growth in length, foldable absorbent panel 48 has been returned to a substantially coplanar position with main absorbent body 22, as indicated in Fig. 3, in

order to provide maximum length of about 14 inches to about 15 inches to diaper 2. Ear members 14 and 16 are now attached in a non-overlapping manner to releasably-engageable surface 40 on foldable absorbent panel 48.

5 Referring to Fig. 10, a modification to cushion barriers 52 and 58 is illustrated as numeral 53. This modification includes at least one row 55, and preferably two rows as illustrated, comprising a plurality of cup-like members 57 that receive and collect body wastes. Members 57 face inwardly toward a longitudinal centerline of diaper 2 and, when there are two rows 55, the cup-like members 57 in one row 55 are staggered with members 57 of the other row 55. Members 57 can be liquid permeable or impermeable, and vapor permeable or impermeable. Generally, members 57 are made of a material that can be easily molded or formed to the desired shape and geometry. If desired, these rows 55 of cup-like members 57 also can be provided with cushion barriers 52 and would be positioned between respective cushion barriers 52 and leg cuffs 44.

10 20 Backsheet 18 is a two-ply composite in which the inner ply 24 is liquid impermeable and outer ply 26 liquid permeable. Preferably, inner ply 24 is a polypropylene film having a thickness of about 0.5 to about 1.0 mil, and outer ply 26 is spunbond polypropylene having a basis weight of about 0.3 to about 1.0 ounce per square yard; the 25 polypropylene fibers being bilobal in shape, and having a denier of about 1.5 to about 4.0 denier per filament (dpf). Inner and outer plies 24 and 26 can be joined in any suitable manner, such as by spray adhesive, lines of adhesive, dot bonding, thermal bonding, sonic bonding, extruding the film layer onto the spunbond layer, and the like. Backsheet 18 may be made of other materials that are liquid impermeable or treated to be so. Some examples are meltblown or film material made of polyethylene or polyolefin copolymers.

30 Backsheet 18 may also be vapor permeable as well as liquid impermeable. Backsheet 18 generally will form the shape of diaper 2 and, as illustrated in the figures, is generally hourglass shape with ear members 14 and 16 extending laterally outwardly. Other shapes...

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are usable and will depend upon the types of materials used, their thicknesses, and the like.

5 Topsheet 20 is made of a liquid-permeable material and is preferably a two-layer composite. In a preferred embodiment, topsheet 20 is an integrated bonded carded web having a basis weight of about 1.5 osy (ounces per square yard). Liner layer 21 is made of a

10 polyethylene/polyester bicomponent fiber having a basis weight of about 0.5 osy and a fiber denier of about 2.25 dpf. This type of bicomponent fiber can be purchased from BASF Corporation, Fibers Division, Enka, N.C. 28728. Surge layer 23 is preferably a fiber matrix having a basis weight of about 1.0 osy and comprising about 15 percent by weight polyester fibers having a denier of about 15 dpf and 25 percent by weight of a polyethylene/polypropylene bicomponent

15 fiber. These fibers can be purchased from Chisso Corporation, PP Fiber Division, 6-32, Nakanoshima 3, Kita-Ku, Osaka-530, Japan. These two layers can be integrated by, for example, through-air bonding or infra-red bonding. Topsheet 20 preferably has a density of about 0.02 gcc (grams per cubic centimeter) and a bulk thickness of about 0.10 inch. This combination of layers and fibers provides an extremely soft, gentle surface for placement against the newborn's skin and is one of the unique features of the present invention.

20 Although a preferred embodiment of topsheet 20, topsheet 20 can have a basis weight between 15 to about 102 gsm (grams per square meter), a density between about 0.01 to about 0.08 gcc (grams per cubic centimeter) a fiber denier between about 1 to about 15 dpf, and fiber lengths between about 0.5 to about 2.0 inches in which the fibers may be crimped in a range of about 14 to about 22 crimps per inch.

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30 Topsheet 20 can also be made of other liquid-permeable materials, such as spunbond webs of synthetic polymer filaments, a spunlace web, and the like. Topsheet 20 can have the same shape as backsheet 18 or may be smaller in length or width. However, it is preferred that topsheet 20 and backsheet 18 have peripheries that extend outwardly

35 beyond main absorbent body 22 so that their peripheral portions can be adhered together, such as by lines of adhesive or sonic bonding, or a combination of both.

Main absorbent body 22 is preferably a mixture of pulp fluff and superabsorbent material in which the fluff is present in the amount of about 13.4 grams and the superabsorbent material is present in the amount of about 7.2 grams. A suitable superabsorbent material can be

5 purchased from Hoechst Celanese, Super Absorbent Division, Portsmouth Technical Center, 3340 West Norfolk Road, Portsmouth, VA 23703. Other superabsorbent material can be suitably used, and examples include organic materials such as silica gels or organic compounds such as cross-linked polymers. The superabsorbent materials can be

10 in various forms, such as particles, fibers, layers, and the like. The superabsorbent material and fluff can be uniformly blended, blended to have a Z-gradient, or the superabsorbent material can be layered or multi-layered within the fluff. Absorbent body 22 preferably has a surface area of about 41 square inches, a density of

15 about 0.2 gcc, and a basis weight of about 778 gsm. Absorbent body 22 includes two layers of standard tissue wrap having a basis weight of about 22 gsm. The tissue wrap is adhesively sealed about the perimeter of absorbent body 22 or can be heat sealed if desired.

20 Foldable absorbent panel 48 can be made of the same identical materials as absorbent body 22 or from different suitable materials. For example, it may be preferred that foldable panel 48 not be absorbent and, thus, would be made of a nonabsorbent material or of an absorbent material being enclosed within a liquid-impermeable

25 layer.

Both main absorbent body 22 and absorbent panel 48 can be attached or joined to backsheet 18 in any suitable manner, such as by lines of adhesive.

30 Releasably-engageable surfaces 38, 40 and 42 are preferably made of a loop material purchasable from Guilford Mills, Inc., 6001 West Market Street, Greensboro, North Carolina, 27402, and identified as Guilford Loop Style No.s 18903 or 19902. The shape of each

35 releasably-engageable surface 38, 40 and 42 is dependent upon the overall shape of diaper 2. As illustrated, releasably-engageable surface 38 is rectangular, and releasably-engageable surfaces 40

and 42 are also rectangular and extend nearly the width of front section 4. Releasably-engageable surfaces 38, 40 and 42 can be attached to backsheet 18 by lines of adhesive, sonic bonding, or any other suitable means.

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Releasably-engageable surfaces 32 are preferably a hook material purchasable from Velcro USA, Manchester, NH, and are identified as Hook HTH 708. Releasably-engageable surfaces 32 are attached to ear members 14 and 16 by lines of adhesive, sonic bonding, or the like.

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The elastic material of which elastic threads 46, elastic threads 50, elastic threads 62, and elastic strands 72 are made is preferably Lycra.

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Cushion barriers 52 and 58 can be made of the same material as main absorbent body 22, or may be made of fluff fibers or synthetic fibers alone. If it is desired that barriers 52 and 58 not be absorbent, then they can be made of any suitable resilient material, such as a foam material.

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Although Fig. 5 illustrated cushion barriers 52 and 58 being replaced by containment flaps 64 and 66, the present invention contemplates other combinations of these elements. For example, diaper 2 may include crotch cushion barriers 52 with waste containment flaps 66 or back waist cushion barrier 58 with containment flaps 64.

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While this invention has been described as having a preferred embodiment, it will be understood that it is capable of further modifications. This application is, therefore, intended to cover any variations, equivalents, uses, or adaptations of the invention following the general principles thereof, and including such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A growth adjustable absorbent article having a length, said article comprising:
  - a backsheet including a front section having a front edge, a back section having a back edge, and an intermediate crotch section,
  - 5 a liquid-permeable topsheet,
  - a main absorbent body being disposed on at least said intermediate crotch section and being positioned between said topsheet and said backsheet,
- 10 a foldable absorbent panel being disposed on said front section between said main absorbent body and said front edge of said front section, said foldable absorbent panel being movable between a first position wherein said foldable absorbent panel is substantially coplanar with said main absorbent body and a second position wherein
- 15 said foldable absorbent panel is folded inwardly upon said main absorbent body, whereby the length of said article is adjustable to accommodate growth of a newborn baby, and
- 20 an elastic member positioned between said foldable absorbent panel and said topsheet wherein said front section curves concavely in the direction of said topsheet when said foldable panel is substantially coplanar with said main absorbent body and when said elastic member is relaxed.

2. The article of claim 1 wherein said front section curves convexly in the direction of said topsheet when said foldable panel is folded inwardly upon said main absorbent body and when said elastic member is relaxed.
3. The article of claim 1 further comprising a first releasably-engageable surface attached to an outer surface of said absorbent article at said front section, and
- 5 a pair of ear members integral with said back section, each said ear member including a second releasably-engageable surface, said second releasably-engageable surfaces being releasably engageable with said first releasably-engageable surface.

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4. The article of claim 3 wherein said first releasably-engageable surface is a loop surface and said second releasably-engageable surface is a hook surface.
5. The article of claim 3 wherein said first releasably-engageable surface comprises a foldable, releasably-engageable surface foldable with said foldable absorbent panel, and a nonfoldable, releasably-engageable surface on said backsheet positioned inwardly of said foldable, releasably-engageable surface.
6. The article of claim 5 wherein said second releasably-engageable surfaces are releasably engageable with both said foldable and nonfoldable, releasably-engageable surfaces.
7. The article of claim 5 wherein said second releasably-engageable surfaces are releasably engageable to one of said foldable and nonfoldable, releasably-engageable surfaces.
8. The article of claim 3 wherein one of said ear members further includes a third releasably-engageable surface attached to an outer surface of said absorbent article, said second releasably-engageable surface of said one ear member being releasably engageable with said first releasably-engageable surface, and  
5 said second releasably-engageable surface of said other ear member being releasably engageable with said third releasably-engageable surface on said one ear member.
9. The article of claim 8 wherein said first releasably-engageable surface comprises a foldable, releasably-engageable surface, and a nonfoldable, releasably-engageable surface positioned inwardly of said foldable, releasably-engageable surface,  
5 said second releasably-engageable surface of said one ear member being releasably engageable with said nonfoldable, releasably-engageable surface positioned inwardly of said foldable, releasably-engageable surface when said foldable absorbent panel is in said folded second position,

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10 said second releasably-engageable surface of said other ear member being releasably engageable with said third releasably-engageable surface on said one ear member.

10. The article of claim 9 wherein each of said first and third releasably-engageable surfaces comprise a loop surface and said second releasably-engageable surface comprises a hook surface.

11. The article of claim 1 wherein said topsheet comprises bicomponent fibers.

12. The article of claim 11 wherein said bicomponent fibers are sheath-core fibers.

13. The article of claim 11 wherein said bicomponent fibers are side-by-side fibers.

14. The article of claim 11 wherein said topsheet has a basis weight between about 15 to about 102 grams per square meter and a density between about 0.01 to about 0.08 gram per cubic centimeter.

15. The article of claim 11 wherein said fibers have a denier between about 1 to about 15 denier per filament, and a length between about 0.5 to about 2.0 inches.

16. The article of claim 11 wherein said fibers are crimped in a range of about 14 to about 22 crimps per inch.

17. The article of claim 1 further comprising a pair of containment flaps.

18. The article of claim 1 further comprising a waist containment flap attached at said back section near said back edge.

19. A growth adjustable absorbent article, comprising:  
a backsheet including a front section having a front edge, a back section having a back edge, and an intermediate crotch section,

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5        a liquid-permeable topsheet,  
a main absorbent body being disposed on at least said  
intermediate crotch section and being positioned between said  
topsheet and said backsheet,

10      a foldable absorbent panel being disposed on said front  
section between said main absorbent body and said front edge, said  
foldable absorbent panel being positioned between said topsheet and  
said backsheet and being movable between a first position, wherein  
said foldable absorbent panel is substantially coplanar with said  
main absorbent body, and a second position, wherein said foldable  
absorbent panel is folded inwardly upon said main absorbent body,

15      an elastic member positioned between said foldable absorbent  
panel and said topsheet wherein said front section curves concavely  
in the direction of said topsheet when said foldable panel is  
substantially coplanar with said main absorbent body and when said  
elastic members are relaxed,

20      a pair of ear members integral with said back section,  
one of said ear members being releasably engageable with said  
front section, and  
the other said ear member being positionable between a  
first position wherein said other ear member overlaps and is  
25      releasably engageable with said one ear member and a second position  
wherein said other ear member is spaced from said one ear member and  
is releasably engageable with said front section.

20. The article of claim 19 wherein said other ear member is  
positionable at said first position when said foldable absorbent  
panel is at said second position.

21. The article of claim 19 wherein said other ear member is  
positionable at said second position when said foldable absorbent  
panel is at said first position.

22. The article of claim 19 further comprising a pair of containment  
flaps.

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23. The article of claim 19 further comprising a waist containment flap attached at said back section near said back edge.

24. The article of claim 19 wherein said topsheet comprises bicomponent fibers.

25. The article of claim 24 wherein said bicomponent fibers are sheath-core fibers.

26. The article of claim 24 wherein said bicomponent fibers are side-by-side fibers.

27. The article of claim 24 wherein said topsheet has a basis weight between about 15 to about 102 grams per square meter and a density between about 0.01 to about 0.08 gram per cubic centimeter.

28. The article of claim 24 wherein said fibers have a denier between about 1 to about 15 denier per filament, and a length between about 0.5 to about 2.0 inches.

29. The article of claim 24 wherein said fibers are crimped in a range of about 14 to about 22 crimps per inch.

30. A growth adjustable absorbent article, comprising:

a backsheet including a front section having a front edge, a back section having a back edge, and an intermediate crotch section, a liquid-permeable topsheet,

5 a main absorbent body being disposed on at least said intermediate crotch section and being positioned between said topsheet and said backsheet,

a foldable absorbent panel being disposed on said front section between said main absorbent body and said front edge, said foldable absorbent panel being positioned between said topsheet and said backsheet and being movable between a first position, wherein said foldable absorbent panel is substantially coplanar with said main absorbent body, and a second position, wherein said foldable absorbent panel is folded inwardly upon said main absorbent body, . . . . .

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15 an elastic member positioned between said foldable absorbent panel and said topsheet, wherein said front section curves concavely in the direction of said topsheet when said foldable panel is substantially coplanar with said main absorbent body and when said elastic members are relaxed, and

20 a pair of ear members integral with said back section and being releasably engageable with said front section.

31. The article of claim 30 wherein said topsheet comprises bicomponent fibers.

32. The article of claim 31 wherein said bicomponent fibers are sheath-core fibers.

33. The article of claim 31 wherein said bicomponent fibers are side-by-side fibers.

34. The article of claim 31 wherein said topsheet has a basis weight between about 15 to about 102 grams per square meter and a density between about 0.01 to about 0.08 gram per cubic centimeter.

35. The article of claim 31 wherein said fibers have a denier between about 1 to about 15 denier per filament, and a length between about 0.5 to about 2.0 inches.

36. The article of claim 31 wherein said fibers are crimped in a range of about 14 to about 22 crimps per inch.

37. The article of claim 30 further comprising a pair of containment flaps.

38. The article of claim 30 further comprising a waist containment flap attached at said back section near said back edge.

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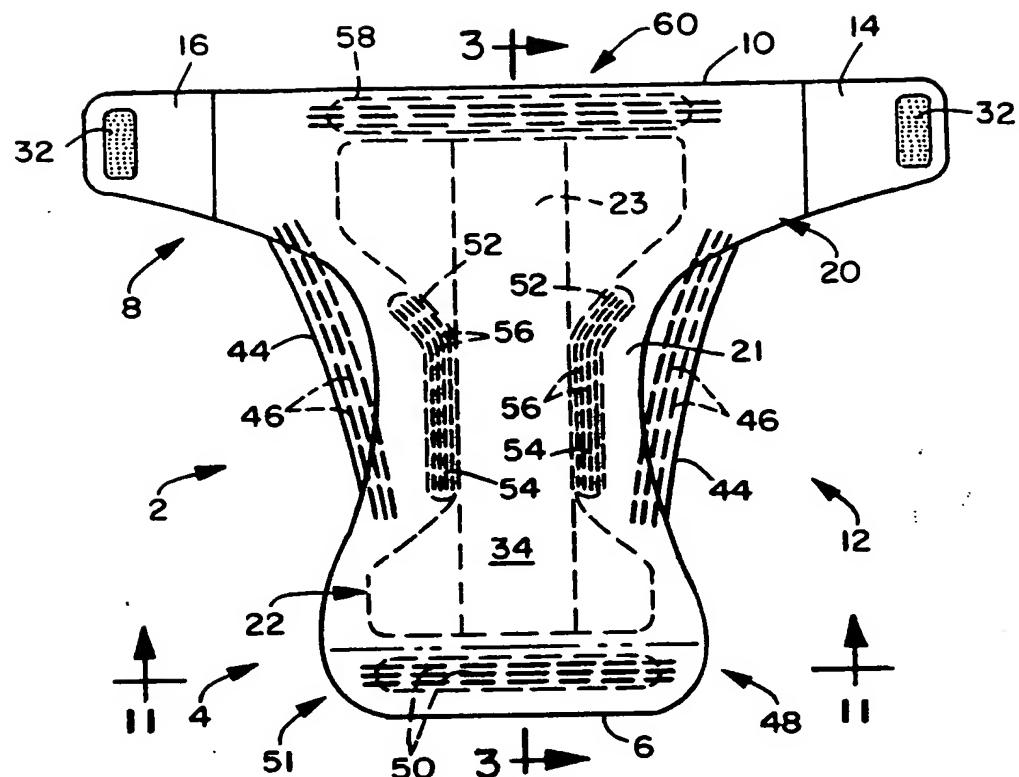


FIG. I

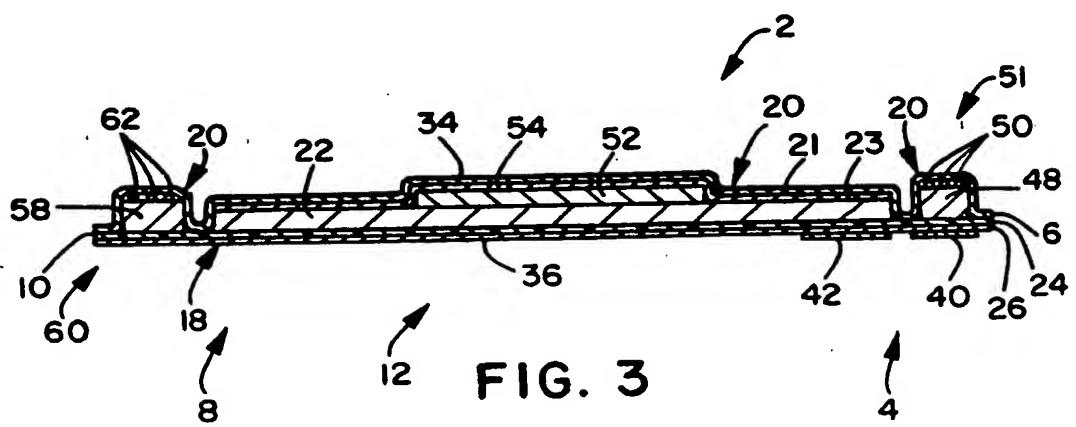


FIG. 3

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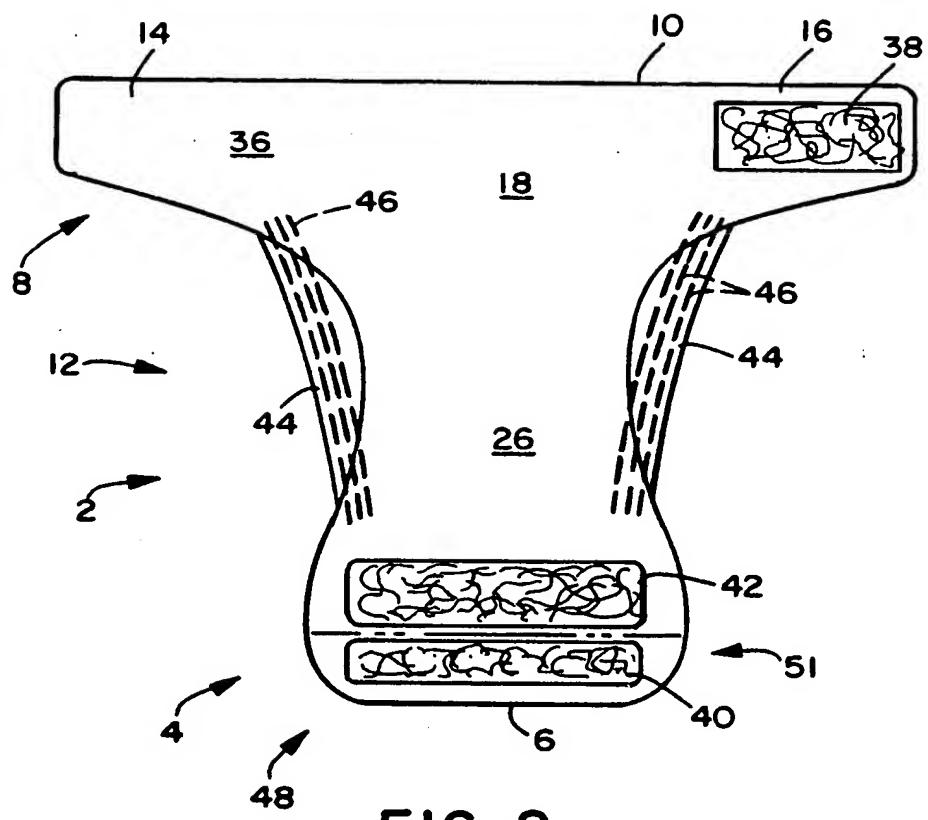


FIG. 2

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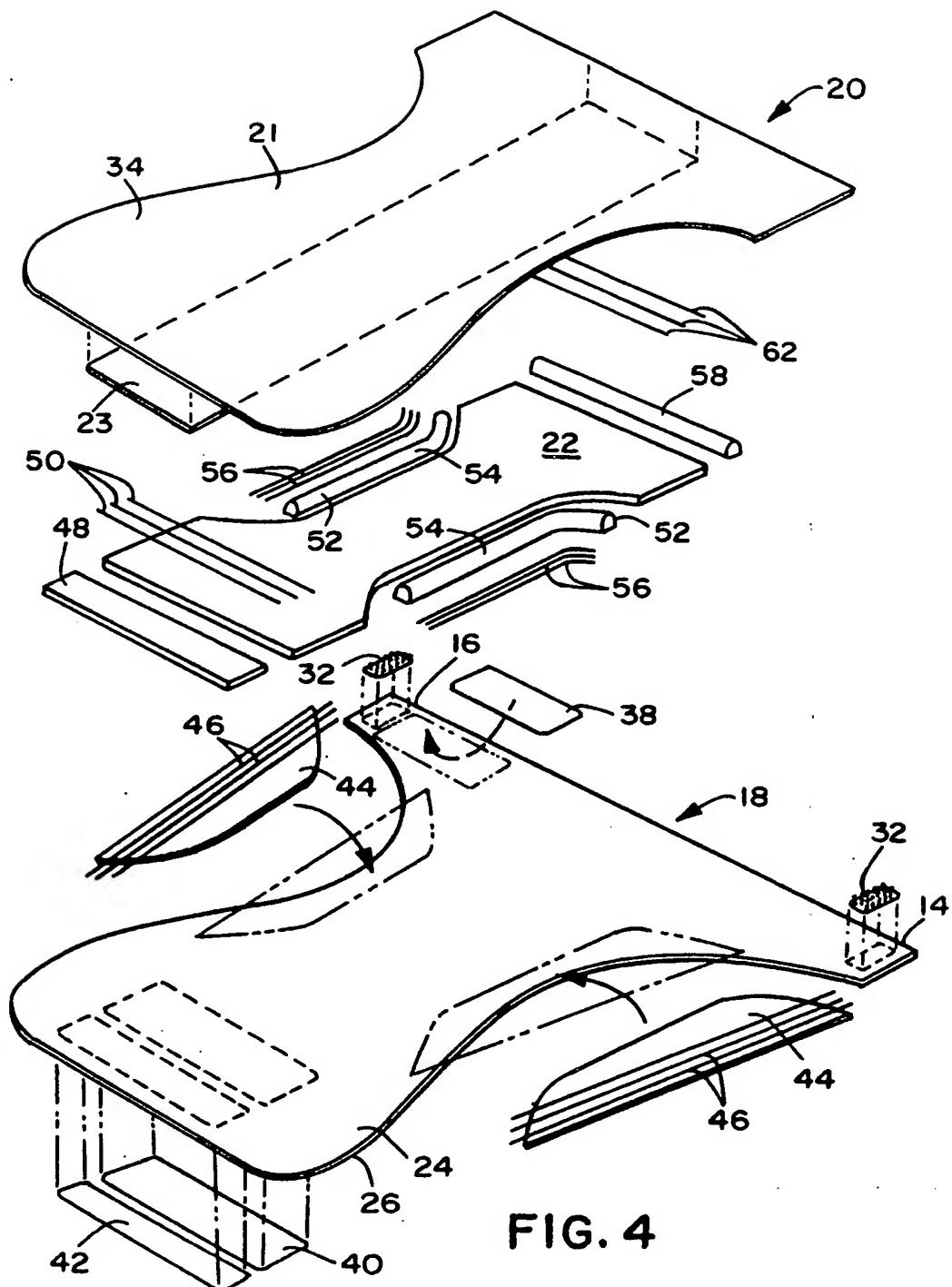


FIG. 4

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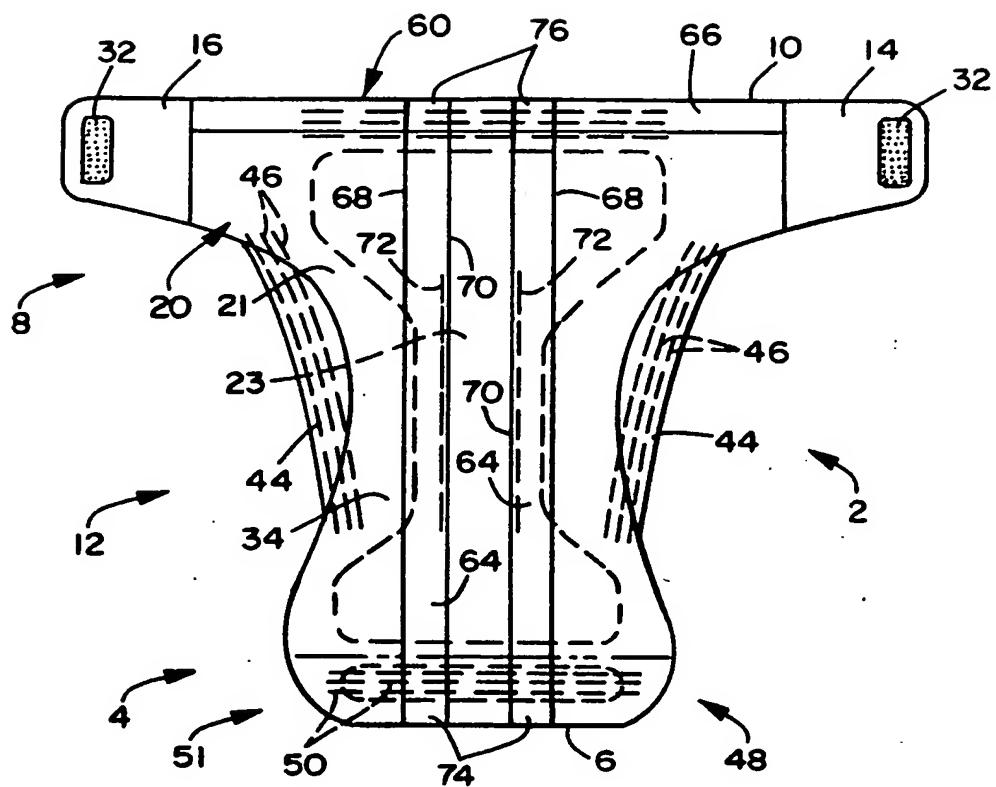


FIG. 5

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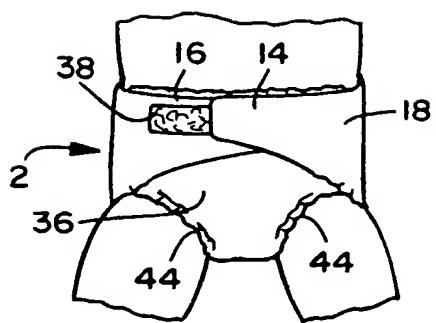


FIG. 6

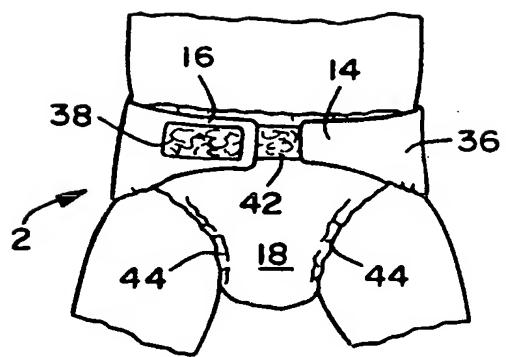


FIG. 7

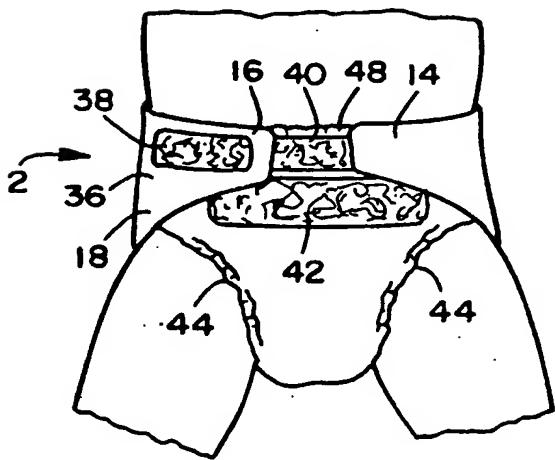
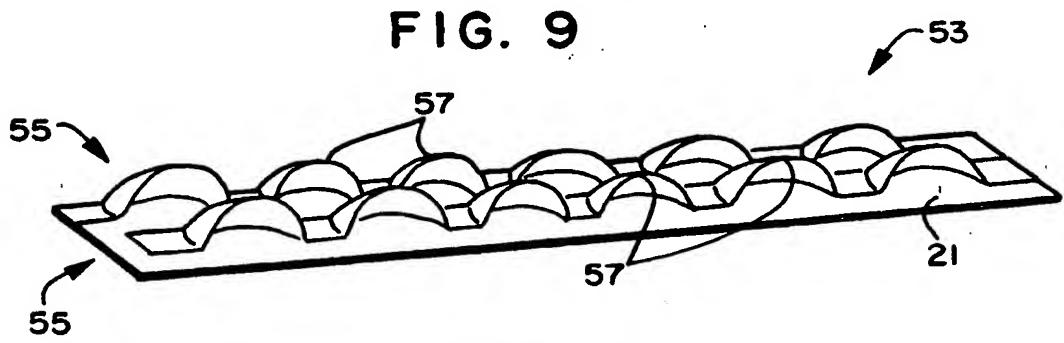
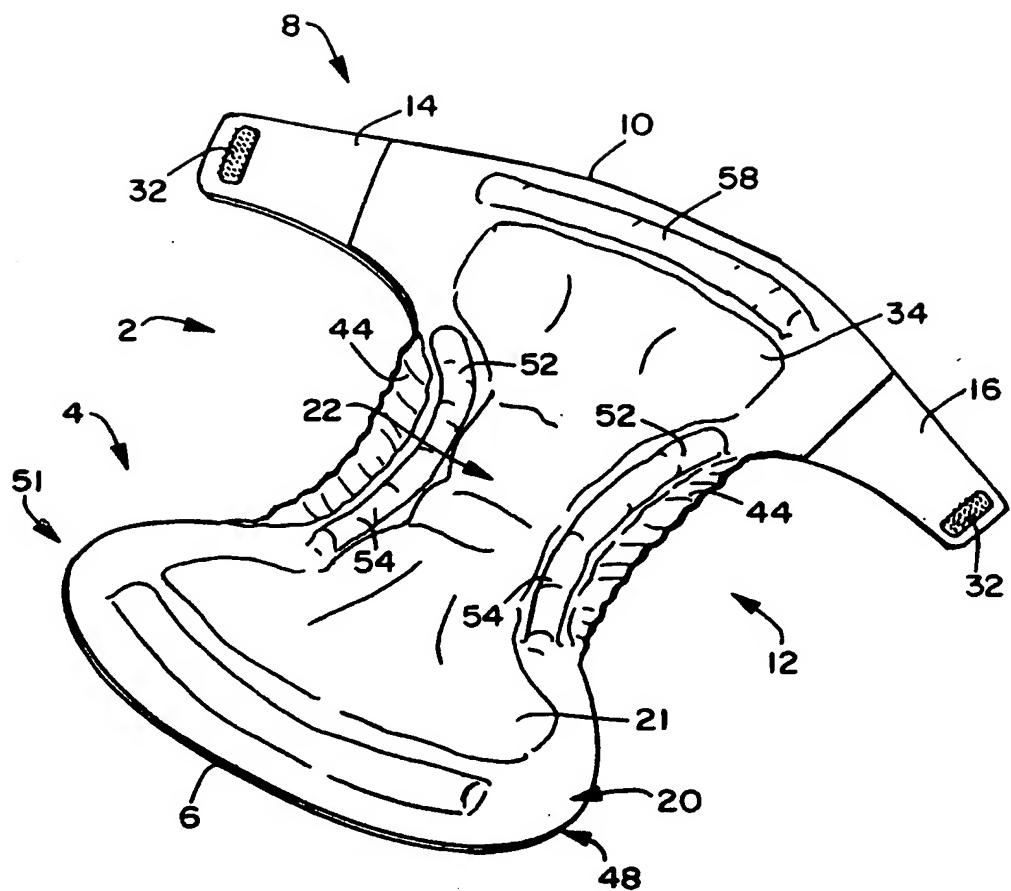
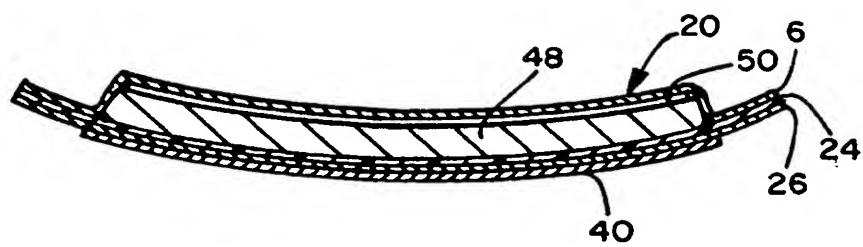


FIG. 8

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**FIG. 11**